

5       What is claimed is

1.       A medical device comprising a generally longitudinally-extending wire core, a portion of said core more adjacent the distal end thereof than the proximal end thereof being wound to form a helical coil which tapers in  
10       diameter from a larger diameter end at the proximal end thereof to a smaller diameter end at the distal end thereof, at least the portion of said core forming said helical coil being made of a super-elastic deformable material.
2.       The medical device of claim 1, including a wrapped helical spring  
15       surrounding a longitudinally-extending portion of said core.
3.       The medical device of claim 2, wherein said spring surrounds a major fraction of the overall length of said core.
- 20       4.       The medical device of claim 2, wherein the distal and proximal ends of said spring are attached to said core.
5.       The medical device of claim 2, wherein said spring includes a first spring portion surrounding a first longitudinally-extending portion of said core  
25       and a second spring surrounding a second longitudinally-extending portion of said core, said second longitudinally-extending portion including said helical coil, said portions being adjacent to one another, and adjacent ends of said spring portions being attached to each other and to said core in a region proximal of said helical coil.  
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6.       The medical device of claim 5, wherein the first spring portion and said second spring portion comprise wires of different diameters.

- 5        7.     The medical device of claim 2, wherein the spring comprises stainless steel.
8.     The medical device of claim 2, wherein a layer of a polymeric material substantially covers the outer surface of said spring.
- 10      9.     The medical device of claim 8, wherein the polymeric material comprises a fluorinated polymer.
- 15      10.    The medical device of claim 9, wherein the fluorinated polymer is polytetrafluoroethylene.
11.    The medical device of claim 4, wherein the distal and proximal ends of said spring are attached to said core by a weld or braze.
- 20      12.    The medical device of claim 5, wherein the adjacent ends of said first and second spring sections are attached to each other and to said core by an epoxy.
- 25      13.    The medical device of claim 12, wherein the epoxy comprises epoxy which cures upon exposure to ultraviolet radiation.
14.    The medical device of claim 1, wherein said core comprises a super-elastic deformable material.
- 30      15.    The device of claim 1, wherein said super-elastic deformable material is an alloy comprising nickel and titanium.

5        16.    The device of claim 15, wherein the alloy consists of nickel, titanium, and chromium.

17.    A medical device comprising:

10        a generally longitudinally-extending wire core, a portion of said core more adjacent the distal end thereof than the proximal end thereof being wound to form a helical coil which tapers in diameter from a larger diameter end at the proximal end thereof to a smaller diameter end at the distal end thereof, at least the portion of said core forming said helical coil being made of a super-elastic deformable material; and,

15        a pair of wrapped helical springs surrounding the wire core, one of said springs extending distally from a point adjacent the proximal end of said core, the other of said springs extending proximally from a point adjacent the distal end of said core to a point proximal to said helical coil, one end of one of said springs being connected one end of the other of said springs and to said core, and the other end of each of said springs being connected to the core.

18.    A medical device comprising:

25        a guidewire including a longitudinally-extending wire core, a portion of said core more adjacent the distal end thereof than the proximal end thereof being wound to form a helical coil which tapers in diameter from a larger diameter end at the proximal end thereof to a smaller diameter end at the distal end thereof, at least the portion of said core forming said helical coil being made of a super-elastic deformable material; and,

30        a flexible tubular sheath surrounding a portion of and being movable axially relative to said guidewire,

the sheath having an inner diameter that is greater than the diameter of the guidewire other than a portion of said guidewire forming said helical coil,

5 such that said coil deforms into a configuration having a maximum diameter not more than the inner diameter of said sheath upon retraction into the sheath and returns to a coil configuration having a maximum diameter greater than the outer diameter of said sheath upon withdrawal from the sheath.

10 19. The device of claim 18, wherein said guidewire includes one or more wrapped helical springs surrounding a longitudinally-extending portion of said core, and a polymeric material covering a major fraction of the outer surface of said springs.

15 20. A medical procedure comprising the steps of:  
providing a medical device according to claim 18 in a configuration in which the helical coil of the guide wire of said device is retracted into the tubular sheath of said device;

20 introducing the device in said configuration into a desired pathway within a body;

positioning the device in a desired location within said pathway;  
moving the helical coil portion of the guidewire relative to the sheath such that the helical coil portion of the guide wire is withdrawn from the sheath and returns to a coil configuration and in which the coil engages the  
25 inner surface of the pathway.

21. The procedure of claim 20, wherein a biological calculus is within said pathway and said procedure includes fragmentation of the calculus, including the steps of:

30 locating the biological calculus within the pathway;  
placing at least a portion of the sheathed guidewire beyond the location of the calculus; and

5 moving the guidewire relative to the sheath such that the helical coil portion thereof is exposed from the distal end of the sheath and reforms into a helical coil configuration distally of the calculus.

10 22. The procedure of claim 20, wherein the procedure further comprises the step of fragmenting a biological calculus located in a desired location in said pathway and distally to the coil that has engaged the inner surface of the pathway, using lithotripsy.

15 23. The procedure of claim 22, wherein the lithotripsy comprises one of electrohydraulic, pneumatic pulse, acoustic shock wave, and laser lithotripsy.

24. The medical device of claim 1, wherein at least a portion of the device includes a layer of radiopaque material.

20 25. The medical device of claim 24, wherein the radiopaque material comprises gold, platinum, tantalum, tungsten, iridium, rhodium, rhenium, or an alloy of two or more radiopaque materials.

25 26. The medical device of claim 18, wherein at least a portion of the flexible tubular sheath comprises a layer of a radiopaque material.

27. The medical device of claim 26, wherein the radiopaque material comprises gold, platinum, tantalum, tungsten, iridium, rhodium, rhenium, or an alloy of two or more radiopaque materials.

30 28. The medical device of claim 17, wherein a portion of the coil is covered with a radiopaque material.